National Airport Pavement Test Facility, Building 296

Airport pavement design today is very much the result of extrapolating empirical methods of highway engineering origins, which is some 50 years old.

Over 25 years ago, limited full-scale tests were conducted to adapt these methods to accommodate heavier, more complex aircraft. The basic underlying theoretical foundations, although adequate at the time, do not offer a satisfactory method to systematically address the new configurations and high aircraft loads of tomorrow's aircraft; continued use could very well lead to unnecessarily thick pavements. The introduction of the Boeing 777 aircraft in 1995 and the planned introduction of a new generation of heavy civil transport aircraft by manufacturers from both sides of the Atlantic have necessitated a fundamental need to develop new pavement design procedures based on sound theoretical principles and with models verified from full-scale test data. Validated pavement design procedures are needed if we are to know with certainty whether existing runways or taxiways can support the kind of loads envisioned or whether major pavement improvements will be required.

In response to the requirement for developing validated pavement design procedures, a working group representing both industry and government was formed to assist the Federal Aviation Administration (FAA) in determining the full-scale testing needs required to develop the new design procedures. Major recommendations of the working group were included in a request for proposals to design and build the National Airport Pavement Test Facility at the William J. Hughes Technical Center.

Funding was provided jointly by the FAA (two-thirds) and The Boeing Company (one-third). A contract was awarded to MJM/Cornell Joint Venture on April 18, 1996, and the facility was dedicated on April 12, 1999.

The test facility consists of five subsystems: test pavement, test vehicle, support foundation, overhead enclosure, and instrumentation system.

Facility Specifications

- Full-scale loading representing new generation heavy civil transport aircraft
  - up to 75,000 pounds per wheel on two landing gears with 6 wheels per gear (total of 12 wheels)
  - single, dual tandem, and tridem loading configurations
  - capability to change wheel spacing and gear spacing
  - maximum tire size of 56 x 24 inches

- Multiple test items
  - test pavement: 900 feet long and 60 feet wide
  - width of 60 feet to investigate load
  - interaction effects
  - three subgrade materials (in the range of 3% to 20% California Bearing Ratio)
  - asphalt and concrete surfaces - a total of nine test sections

- Tests were run to pavement failure, with failure of a test section to occur in 1 year or less

- Speeds to represent worst-case pavement response
  - capability to conduct tests at 5 to 15 miles per hour
  - capability to run tests in both directions

- Accommodate lateral wander patterns, typical of airport runway operations

- Continuous and automatic operation of the test vehicle

- Automatic tire loading

- Pavement response sensors to record strain, deflection, pressure, moisture, and temperature

The comprehensive test program includes response tests designed to measure wheel interaction effects at different wheel and gear spacings and trafficking tests to develop pavement failure criteria. Trafficking tests are conducted on both rigid and asphalt test sections, with both aggregate and stabilized subbases, engineered to provide a range of target design lives. It will take approximately 10 years to complete the full-scale test program. Information on the full-scale test program, including a searchable database, can be found at http://www.airporttech.tc.faa.gov/naptf.

The 60-foot-wide test pavement provides two traffic lanes so that two gear configurations can be tested simultaneously. For example, a six-wheel B777 gear can be tested in one lane, and a four-wheel B747 gear can be tested in the other lane. The tests will be run until all sections have completely failed. The test vehicle can be programmed to skip, or fly over, a failed section or sections. The direct comparison of two different gears is particularly important in finding a resolution for computing the aircraft classification number.

To find out more about the National Airport Pavement Test Facility, contact:

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